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Opportunity for the Young Engineer in the Illinois Road Building Program

By WALTER J. ESSMAN.

The great State of Illinois, which has been lagging behind in construction of roads, has at last awakened and realizes that the surging waves of progress demand that more than a meagre part of the valuable time and money of her industrious sons must be applied to forging suitable highway connections between its towns and cities. In this age of the gas driven vehicle, either commercial or pleasure, the necessity of a roadbed that is usable the year round and presents the least possible obstacle to traffic, is quite apparent.

Illinois has a population of almost 6,000,000 people. In its boundaries is the third largest city in the world. It is almost surrounded by navigable waters which thereby link it with any part of the globe.

A glance at a railroad map of the state will readily show the railroads so interwoven throughout the state that not even the smallest hamlet is any great distance from a shipping point or entraining point and furthermore nearly every great railway system in the United States enters the state.

It has coal in abundance. Its broad fields are fertile and productive. Its wealth is enormous. But, alas! its 96,000 miles of highways are a sad crucifixion to this fair state when the wayfarer from kindred states sojourns within its borders.

It stands twenty-third in good roads—only about one-tenth of its roads being improved. It was thus that Illinois saw herself, girded her belt a notch tighter, and with tremendous energy is now seeking her place among the leaders.

From 1905 to 1918 about a million dollars per year was spent in the road program and only a very small fraction of this went toward building surfaced roads—most of it went to maintain dirt roads. In 1918 the people voted for a bond issue of \$60,000,000 for the purpose of building about 5000 miles of hard surfaced roads. The idea is to have a connecting road between each county seat of the 102 counties.

With this proposed system, practically every town, of 2000 population and over, will be connected by a good, hard-surfaced road. A \$60,000,000 road program is a misnomer. It is spoken of as the \$100,000,000 program. The people of the state voted \$60,000,000 on a state levy. The National Government has recently made appropriations to states who meet such appropriation with a like amount, and Illinois met a

\$12,000,000 appropriation from the Federal Government with \$12,000,000, thus making \$24,000,000. The counties through which Federal aid roads run have put up \$3,000,000. In addition to this there will be several millions spent on State aid roads. It is readily seen that \$100,000,000 or more will be spent in the next several years on roads.

The bulk of this, the \$60,000,000 and interest, will be entirely paid for by the automobiles of the state. In 1919 there were almost 500,000 cars in the state. Starting January 1, 1920, the license fee increases to an average of about \$10 per car per year. With the increase of good, hard-surfaced roads and national prosperity, it is manifest that the number of cars will increase by leaps and bounds.

Henry Ford, who by the way, would rate very low in the "nut test," yet nevertheless, managed to amass considerable of this world's goods, and fame—says, "the increase in Ford licenses alone in Illinois in 25 years will pay the \$60,000,000 and interest." This is not idle speculation, for while Ford cars rank extremely high both in quantity and quality, in the world of motors, many autos of other makes grace the highways of Illinois. I am only digressing here to firmly convince my readers that the Illinois road program calls, not for an expenditure of just \$60,000,000 in the next several years, but even more than \$100,000,000 with only a small fraction of the burden upon the meek and lowly taxpayers, but almost every cent paid by those who use the road directly.

With this immense problem before us,—to prudently expend this vast sum of money, the important role of the engineer comes to the fore.

Reconnaissance surveys must be made, plans drawn, public meetings held, estimates completed, contracts let, construction superintended and duties too numerous to mention that call for the guiding hand of the technical man.

About 5 per cent of the entire allotted sum will be used to recompense the engineer for his part in the above program.

The Illinois Division of Highways of the Department of Public Works in 1919 consisted of a main department at Springfield and the state divided into nine districts.

The department at Springfield with chief executive offices and bridge department, employ quite a

number of engineers mostly executive and office type.

Each of the nine districts during the year 1919 have had in their employ from 15 to 35 men mostly of the field specie and with a few of the office variety of engineer. The Highway Department employed more than 300 engineers last year. While highway construction work should have technical men who have been educated as civil engineers, yet, due to the shortage of "civils" last year, there were found on the highway roster, not only civils but miners, mechanics and some few surveyors.

It will be remembered that the really big road program is just in its infancy. Public meetings will be held this winter and the routes decided upon by the people—and powerful politicians—and next spring the Highway Department expects to place under construction at least 1000 miles of road, besides completing probably 50 per cent of the 600 or 700 miles of roads that are now under contract. This year Illinois needed over 300 engineers with 600 or 700 miles of road under construction—then with 1300 or 1400 miles being attended to will call for around 600 engineers.

Mr. G. F. Burch, Bridge Engineer, who hires all the personnel of the district engineering corps, has stated for publication that he estimates conservatively, that each of the nine districts will need at least 50 men. Nine-tenths of these men will be Junior Highway Engineers who make surveys, draw the plans, complete the estimates, superintend the construction, etc. The remuneration for Junior Engineers, is \$125.00 and expenses while out in the field, which is practically all the time during the open months. The expenses usually run approximately \$50 per month. Thus the young engineer is enabled to earn during the open season, approximately 175 to 200 dollars per month. This is a fair recompense for embryonic engineers just entering on a professional career, and even though they do not intend to make Highway Engineering their life's work, yet a few years spent in this ever-increasing branch of engineering field would be of great value to any man.

The work, in the Illinois State Highway Department, is ideal for any ambitious young engineer to take up. It consists of making surveys in the field, of proposed routes, office work in the winter months of making plans, profiles, grades, computing earthwork, investigating prices of various construction materials, making estimates of costs, etc. During the open season for road building, and after contracts are let, the Junior Engineers are sent out on the job to supervise the construction of the road or bridges, as the representative of his District Engineer. While in this capacity, he becomes acquainted with contracting methods, amount of work laborers can do per day, how to handle labor, various kinds of construction ma-

chinery and their possibilities, form building, concrete mixing and placing, and many other phases of practical work that an engineer must know, who entertains the ambition to some day be more than just a "surveyor." A very good working knowledge of these fundamentals can be picked up by a couple of years' work with this Highway Department, and even with a couple of summer vacation periods spent there, is quite an advantage.

The Illinois State Highway Department employed quite a number of men who have had only as high as third year's standing in college during the past year. This is not as desirable as the department would like, because these men usually only work during summer vacation periods, yet, in the 1920 season they will need so many Junior Highway Engineers that they will take all the men with three year's college training who apply and possibly take some progressive sophomores. This is corroborated by the fact that the department admits that the engineering personnel will be doubled next year. This same condition is going to prevail in most State Highway Departments next year. The Government estimates that it is desired to expend \$600,000,000 on modern highways in 1920 and the maximum expenditure for highways in any one year preceding this was in 1919 when not quite \$200,000,000 was expended. Naturally, the question comes, will the supply of "civils" equal the demand?

Already there are strong advocates of a short two-year course in Highway Building, similar to Short "Ag" or "Mine" course now to be had in some universities. This is the forerunner of an unprecedented demand for men of our profession. Young men who are freshmen engineers in college today should thoroughly consider the demands of the State Highway Departments before turning down the opportunity to become a civil engineer.

This Illinois State Highway Department is a progressive, efficient and modern road building department and is free from political hindrance in hiring its personnel. Each applicant must take civil service examination after a few weeks tenure in the department. The civil service law demands that each employe be a resident of the State of Illinois, but this obstacle is overcome by the applicant claiming residence in the State of Illinois from the date of his arrival in Springfield. The examination is now merely a case of relating experience, education, etc.

The engineers who are in charge of the various executive divisions at Springfield are all able engineers. The District Engineers, who have charge of the nine districts throughout the State, are engineers who have come up throughout the department from Junior Highway Engineers and know the work well. They

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000 miles of highways at a cost of around \$3,000,000,000. It is necessary for the "civils" to sharpen their pencils and adjust their transits and levels and try to fill up the gap. There is no relief in sight from men returning from the Service as they have all been absorbed by the industrial world, hence, it is necessary for our great universities to redouble their efforts and supply the men.

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are broad, congenial employers and are, above all, loyal to the men who work under them.

Any engineer who goes out to work for the Illinois State Highway Department should have enough money with him to finance him for a month.

Out in the field, each engineer pays his own expenses and turns in his bill and receipts on the 18th day of the month. It is then about the 15th of the next month when this is refunded. Also the department, through no fault of its own, only pays once a month and sometimes this is delayed. This is the only criticism to offer about the work. This is an injustice. Here is a great State whose laws compel all employers to pay its labor not more than 15 days apart, yet in the matter of paying its own employees, 30-day intervals or more are allowed to pass ere the salary check comes around.

The Illinois State Highway Department offers a very desirable position both from the standpoint of pecuniary reward and from the gain in experience offered to young engineers. The writer worked in the field for this department during the summer of 1919 and can heartily recommend any civil to try it and am sure he will be pleased to assist these people solve their road problem.

This article is supposed to deal with the opportunities of the young engineer in the Illinois Road Building program, but the opportunity has expanded until now almost every state has embarked upon a gigantic road building project which is going to offer excellent opportunities for civil engineers.

The writer believes that from 1920 to 1925 there is going to be a serious shortage of civil engineers due mainly to this enormous demand for hard-surfaced roads. This period is a parallel to that of the early '80s when about 40,000 miles of railroads were built at a cost of some \$800,000,000. Now we demand 100,-